

3-2 Solving Systems Algebraically

Substitution and Elimination

Substitution

$$\begin{aligned}
 x + 4y &= 26 & \rightarrow x &= -4y + 26 \\
 x - 5y &= -10
 \end{aligned}$$

$x = 10$

$$\begin{aligned}
 -4y + 26 - 5y &= -10 \\
 -9y &= -36 \\
 y &= 4
 \end{aligned}$$

$(10, 4)$

Substitution

$$\begin{aligned}
 3x + y &= 18 & \rightarrow y &= -3x + 18 \\
 4x + 5y &= 13
 \end{aligned}$$

$$\begin{aligned}
 4x + 5(-3x + 18) &= 13 \\
 4x - 15x + 90 &= 13 \\
 -11x &= -77 \\
 x &= 7
 \end{aligned}$$

$(7, -3)$

Elimination

$$\begin{aligned}
 (x + 2y &= 10) \cdot (-1) & \text{Create exact} \\
 x + y &= 6 & \text{opposites for} \\
 \hline
 -x - 2y &= -10 & \text{one of the} \\
 x + y &= 6 & \text{coefficients} \\
 \hline
 -y &= -4 \\
 y &= 4
 \end{aligned}$$

$x = 2$ $y = 4$ $(2, 4)$

Elimination

$$\begin{array}{r}
 \left\{ \begin{array}{l} 2x + 3y = 12 \\ 5x - 2y = 11 \end{array} \right. \begin{array}{l} \times 2 \\ \times 3 \end{array} \\
 \hline
 \begin{array}{r} 4x + 6y = 24 \\ 15x - 6y = 33 \\ \hline 19x = 57 \\ x = 3 \end{array}
 \end{array}$$

$(3, 2)$

Elimination

$$\begin{array}{r}
 \left\{ \begin{array}{l} -3x + 5y = 12 \\ 6x - 10y = -21 \end{array} \right. \times 2 \\
 \hline
 -6x + 10y = 24 \\
 \hline
 0 = 3 \\
 \text{False } \emptyset
 \end{array}$$

Elimination

$$\begin{array}{r}
 \left\{ \begin{array}{l} 3x + 2y = 9 \\ 9x + 6y = 27 \end{array} \right. \times -3 \\
 \hline
 -9x - 6y = -27 \\
 \hline
 0 = 0 \\
 \text{True}
 \end{array}$$

∞ #sol'ns on the line $3x + 2y = 9$